# Cold Weather Safety

# Historical Information

Results of Cold Weather Injuries

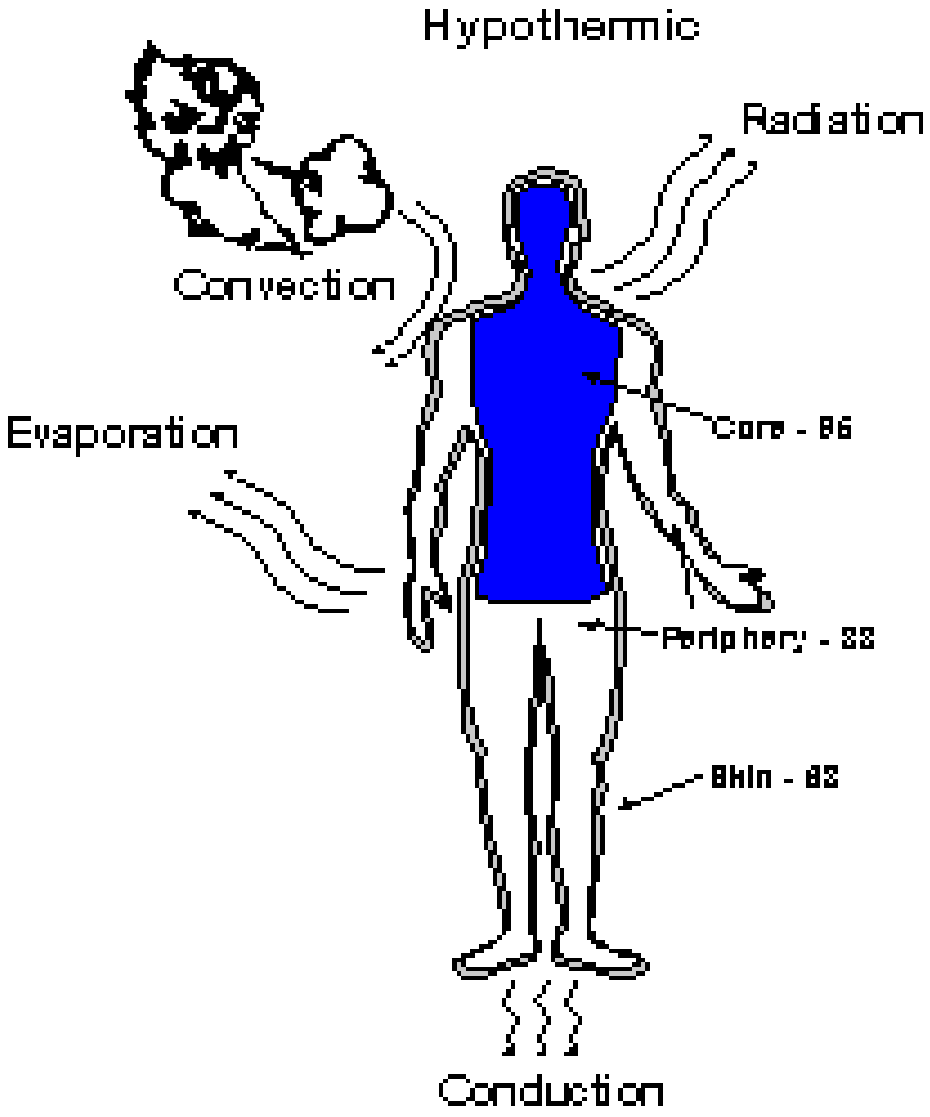
- Napoleon and Hitler both lost Russia due to Cold Weather Injuries.

In the Korean War

- 8,000 cold weather casualties the first winter.

# 5 Methods of Heat Loss

- Evaporation
- Convection
- Conduction
- Radiation
- Respiration



# 5 Methods of Heat Loss

**Evaporation – Method 1**

- Body heat turns liquid into water vapor.
- 1.5 quarts or more of water loss per day.
- Active work contributes to water loss.
- STAY HYDRATED: Drink PLENTY of water.

**Convection – Method 2**

- Loss of heat through the air by blowing over your skin.
- Wind chill cools skin faster than still air.
- COVER exposed skin.
- Take SHELTER from wind.

**Conduction – Method 3**

- Loss of heat due to direct contact environment.
- Clothing conducts heat.
- Sitting in the snow.
- Wet clothes = 5x the conduction.
- Immersion = 25x the conduction.
- STAY DRY!!!

# 5 Methods of Heat Loss

**Radiation – Method 4**

- Body radiates or ‘leaks’ heat through rays or waves.
- You can lose heat even in 70 degrees.
- 40-45% lost through your head & neck.
- Up to 60% is lost if your hands, wrists & ankles are exposed.
- COVER exposed, high radiating areas.

**Respiration – Method 5**

- Air is warmed, then exhaled; result HEAT LOSS.
- Conduction in the lungs.
- QUIT BREATHING? No!!!
- Breathe through nose.
- Use a Neck Gaiter or Balaclava.

# Cold Weather Injuries

Non Freezing
- Hypothermia
- Chilblains
- Trench/Immersion foot

Freezing
- Frost nip
- Frostbite

Associated Injuries
- Snow Blindness
- Dehydration

# 1st Degree Frostbite (Frost Nip)

– **Partial freezing**

– **Stinging**

- Most superficial form of frostbite
- No permanent Cold Weather Injury

– ***Signs/symptoms***

- Redness, mild swelling, pale, and edema

– ***Treatment***

- Warm immediately

# 2nd Degree Frostbite

- Clear Blisters
- Numbness and Burning pain
- Entire epidermis.
- Skin redness in fair individuals.
- Grayish discoloration in darker skinned individuals.
- Clear blister formation at 24-36 hours followed by sheetlike desquamation.
- Persistent cold sensitivity in the area.

# Frostbite

- True freezing injury of tissues.
- Onset signaled by sudden blanching of the skin of nose, ears, cheeks, toes, followed by tingling.
- Frostbite has declared itself when these areas are painless.
- Intense coldness followed by numbness.

# 3rd Degree Frostbite

- –Blue-gray discoloration
- –Bleeding blisters
- –Loss of sensation with pale, yellow, waxy look if unthawed.
- –Poor capillary refill.
- –Tissue loss.
- –Hemorrhagic bullae form in 3rd degree injuries at 12-35 hours unless re-warming is rapid.

# Frostbite

4th Degree

- Blue
- Deeply aching

**–Red discoloring 1-5 days after injury.**

**–4th degree characterized by gangrene, necrosis, auto-amputation.**

**–Permanent anatomic and functional loss.**

# Frostbite Treatment

- RAPID re-warming at temps slightly above body temperature is the single most effective treatment.
- Re-warm until the skin is pliable.
- NO dry heat -- stoves or campfires.
- No re-warming with exercise or rubbing.
- Do not re-warm in the field if there is a risk of refreezing.
- Protection from further injury, pad all affected areas.
- Loosely wrap with gauze and elevate.
- Remove wet and constrictive clothing.

# Snow Blindness

Cause
- Light reflection off snow.

Signs and Symptoms
- Red, itchy eyes.
- Sensitivity to light.

Treatment
- Stay indoors.
- Rest eyes.
- Bandage eyes.

Prevention
- Wear sunglasses.

# Dehydration

- Cause - loss of body moisture
  - Dry air.
  - Cold diuresis.
  - Not enough fluid intake.
- Signs/symptoms
  - Dry lips and mouth.
  - Dark yellow or orange urine.
  - Fatigue.
- Treatment/prevention
  - Drink frequently.
  - 1/2 –1 qt per hour during heavy work load.
  - Timed drinking.
  - Don’t use alcohol or tobacco.

# Cold Weather Injury Prevention Tips

- ***Principles of Care  Need to maintain body heat***
  - Frequent sock changes
    - In WW1, the Brits decreased  trench foot cases from 29,000 in 1915 to 443 in 1917 by sock changes.
  - Cover head and neck,  80% of heat loss.
  - Use synthetic fibers, natural fibers retain moisture and have poor wicking ability.

- ***Modification of Risk Factors***
  - Adequate nutrition:  3000-4000 cal/day.
  - Adequate hydration and rest.
  - Adequate clothing:  loose, layered, windproof and changed often.
  - Buddy system checks.
  - Previous cold weather exposure and experience.

# Dressing for the C O L D

- Keep Clothing Clean

  Dirt and grease block up the air spaces in your clothing and reduce the insulation value.

- Avoid Overheating

  Sweat can freeze on outer layers. Stay dry, moisture will decrease the insulating ability of your clothing.

- Wear Clothing in Layers

  Loose clothing allows air spaces to help trap warm air without restricting blood circulation. Good blood circulation helps to prevent frostbite.

- Keep Clothing Dry

  You've got to keep your clothing dry, from the outside as well as from the inside.

# Cold Weather Uniform

## Layering System

- The first layer: Poly propylene underwear
- The second layer: wool
- The third layer: field jacket liner (optional, but keep it handy).
- The fourth layer: GORTEX parka and pants.

## Additional Items

- Neck gaiter and balaclava:
  - Used for head and neck.
- GORTEX parka hood:
  - Can also be worn with a helmet.
- Vapor barrier boots (Bunny Boots):
  - Ensure the boots are dry. Wick water out with old socks if wet. The tops of the worn wool socks should be turned down over the cold weather boots.
- Cold weather mittens:
  - Ensure they fit loosely to allow circulation and ventilation.

# 6 Keys to Healthy Feet

- Get into a warm area if possible. Remove your boots and socks. Dry your feet, especially between your toes.
- Use foot powder and a antiperspirant.
- Massage your feet for about five minutes increasing circulation.
- Put on a dry pair of socks.
- Dry the inside of your boots or change the liners.
- Do this every 4 hours.

# Protect Your Fingers

- Don’t wear gloves or mittens that are too tight.
- Allow blood to circulate freely.
- Failure to do so will cause hands to become cold, numb, or stiff.

# Sustaining Performance

- Limit Exposure
  - Many tasks can be divided into shorter segments to allow re-warming breaks:
  - For tasks requiring work without gloves, brief re-warming periods in a heated shelter or even time spent with the gloves replaced may maintain sufficient manual dexterity that the task can be completed.
  - It may be necessary to complete the task using a two-team approach, where one team works while the other re-warms.
  - Work should be planned to avoid extended periods of inactivity while scouts are in the cold.

# Key Points

- **Eat and drink more food and water than normal.**
- **Be prepared for sudden weather changes.**
- **Avoid cold injuries by using a buddy system and frequent self-checks.**
- **Immediately treat persons showing any sign/symptom of cold injury.**
- **Sick, injured, and wounded individuals are very susceptible to cold injuries.**

# Lost or Separated

- **Keep calm**
  - **You may only be disoriented. Attempt to retrace your path back to your last known position.**
- **Keep together**
  - **Groups must not split up.**
- **Keep warm**
  - **Assemble shelters whenever stopping, even if only for a short time. Whenever possible, use wood or other locally available fuel for fires. Burning a single candle inside a tent or vehicle can provide enough heat to keep the occupants warm.**
- **Keep fed and hydrated**
  - **Collect all individual food and water supplies and institute rationing.**
- **Keep safe**
  - **If travel on frozen rivers or lakes cannot be avoided, stay near the banks, do not stand close together and watch for spots of unsupported ice resulting from changes in water level.**

# Wind Chill Chart

| *WIND SPEED (IN MPH)* | ACTUAL TEMPERATURE (°F) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 50 | 40 | 30 | 20 | 10 | 0 | -10 | -20 | -30 | -40 | -50 | -60 |
| | EQUIVALENT CHILL TEMPERATURE (°F) | | | | | | | | | | | |
| CALM | 50 | 40 | 30 | 20 | 10 | 0 | -10 | -20 | -30 | -40 | -50 | -60 |
| 5 | 48 | 37 | 27 | 16 | 6 | -5 | -15 | -26 | -36 | -47 | -57 | -68 |
| 10 | 40 | 28 | 16 | 3 | -9 | -21 | -33 | -46 | -58 | -70 | -83 | -95 |
| 15 | 36 | 22 | 9 | -5 | -18 | -32 | -45 | -58 | -72 | -85 | -99 | -112 |
| 20 | 32 | 18 | 4 | -10 | -25 | -39 | -53 | -67 | -82 | -96 | -110 | -124 |
| 25 | 30 | 15 | 0 | -15 | -29 | -44 | -59 | -74 | -89 | -104 | -118 | -133 |
| 30 | 28 | 13 | -2 | -18 | -33 | -48 | -63 | -79 | -94 | -109 | -125 | -140 |
| 35 | 27 | 11 | -4 | -20 | -35 | -51 | -67 | -82 | -98 | -113 | -129 | -145 |
| 40 | 26 | 10 | -6 | -22 | -37 | -53 | -69 | -85 | -101 | -117 | -132 | -148 |

(WINDSPEEDS GREATER THAN 40 MPH HAVE LITTLE ADDITIONAL EFFECT)

LITTLE DANGER
(In less than 5 hrs with dry skin. Greatest hazard from false sense of security)

INCREASING DANGER
(Exposed flesh may freeze within 1 minute)

GREAT DANGER
(Exposed flesh may freeze within 30 seconds)

To determine the windchill temperature, enter the chart at the row corresponding to the windspeed and read right until reaching the column corresponding to the actual air temperature.

# Hypothermia

Number One Killer

- Loss of 4 or more degrees F body temp.
- Wet body contributes.

Cause

- Continued Exposure.
- Depleted energy supply.

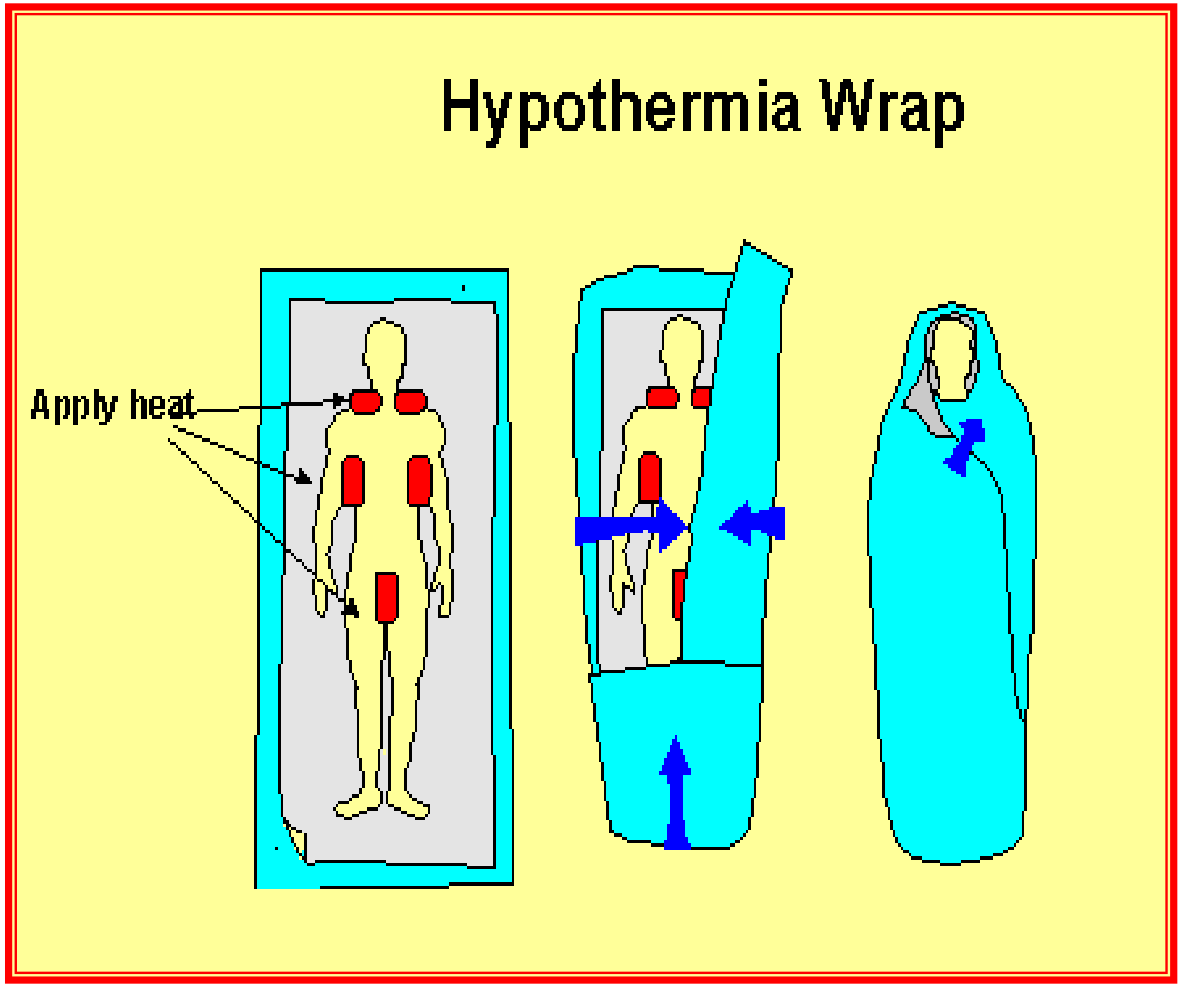
Symptoms

- Shivering.
- Slow and Shallow Breathing.
- Slow Speech.
- Loss of Coordination.
- Memory Lapse.
- Hunger, nausea, fatigue.

# Hypothermia

Treatment

- End exposure.
- Warm beverages.
- Keep victim in warm, dry clothes.
- Gradually re-warm.



# Chilblain

Cause

- Repeated, chronic exposure of bare skin to temps 32º-60ºF.

Sign/Symptoms

- Appear as swollen, tender, papules.
- Complaint of burning or prickly sensation.
- Redness.

Treatment

- Passive warming at room temp.
- No rubbing.
- Protect from trauma and secondary infection.

# Trench/Immersion Foot

- Cause
  - Wet conditions, low temperature.
  - Prolonged contact with moisture at temps between 32º-50ºF
- Signs / Symptoms
  - Numbness and pain.
  - Swelling, tingling, itching.
  - Pale waxy skin.
  - Blistering.
- Treatment
  - Elevate, wrap in loose dressing.
  - Passive re-warming at room temp.
  - No massages or rubbing.
  - Air dry, no immersion in water.